Development of Craniofacial Implants Produced by Metal Injection Molding of Titanium Alloy Using Novel Binder System Based on Palm Oil

Abstract

Metal Injection Molding (MIM) is a cost-effective technique for producing small, complex, precision parts in high volumes. MIM consists of four main processing steps: mixing, injection molding, debinding and sintering. In the mixing step, the powder titanium alloy (Ti6Al4V) medical grade is mixed with a binder system based on palm stearin to form a homogeneous feedstock. The rheological studies of the feedstock have been determined properly in order to success during injection into injection molding machine. After molding, the binder holds the particles in place. The binder systems then have to be removed completely through debinding step. Any contamination of the binder systems will affect the final properties of the parts. During debinding step, solvent extraction debinding has been used to remove partly of the binder systems. The debound part is then sintered at high temperature under control atmosphere furnace. The properties of the sintered craniofacial implants then was measured and compared. The sintered craniofacial implants also then were determined in term of in-vitro cytotoxicity study using mouse fibroblast lines L-929. The results show that the sintered craniofacial implants of titanium alloy produced by MIM fullfill the in-vitro cytotoxicity test.

Authors:	Ibrahim, R.; Azmirruddin, M.; Jabir, M.; Ridhuan, M.; Muhamad, M.; Rafiq, M.; Abu Kasim, N.H.; Muhamad, S.
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